Load Bearing Masonry (LBM) System in a Developing Country

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Abstract
Load-bearing masonry is an alternative method for construction industry especially in the housing project. The adoption of the LBM brings a huge beneficial effect to construction and organization productivity. However, research in the field of the LBM system adoption is still in its limitation. The comprehensive reviews of the literature demonstrate that the majority of the research is discusses about the development and potential of the system compared with investigate the factors influence the adoption of the system. Therefore, this study aims to discuss the past research for LBM system in construction industry.

Keywords: load bearing masonry system (LBM), construction industry, management research

1.0 Introduction

The LBM system is a concept where the floors and walls work together as a system, each giving support to others (Brick Industry Association, 1997) and the simple definition of LBM system, the system is designed to support the building loads by the roof, upper floor slabs, dead load and lateral loads for example wind load.

The LBM masonry is the optional construction methods because of this system potential to overcome the problems in construction industry is one of a good alternative in terms of their advantages, which reduced of construction cost, time and its durability, together with aesthetics and flexibility (Hendry, 2001) compared with the conventional reinforcement concrete (RC) frame system The adoption of LBM system widely used in developed countries for example Europe (Lourence, Asconcelos, & Gouveia, 2008).

The adoption of new method or technologies in construction is influenced by a few factors. Research in the field of the LBM system adoption is still in its limitation. The investigation of the literature demonstrates that the majority of the research is in the technical issues for examples studies about design structure, material testing of structure elements (Hendry, Sinha, & Davies, 2004; Mosele et al., 2006), there is a limited of studies on the management issues such as potential in adoption of the masonry structure. Thus, this paper aims to discuss the previous study of the system based on available relevant literature materials.

2.0 Previous Study of LBM System

The summary of the past study are show in Table 1 and the detailed are as followed:

2.1 Historical and development of masonry

Masonry structures have been used in the earlier part of the century for the smallest to huge buildings, infrastructures and monuments. Masonry is still the most important material for the housing construction, while the developed country has an interest in transforming masonry into variety of structure application (Ramamurthy & Nambiar, 2004) and innovates the design in improvements of performance and serviceability of needed (Beall, 2000).

A review by (Sinha, 2002), his study demonstrated the historical of development of the modern masonry and also exploitation for some innovation large-scale structures such as retaining wall, water tower and shopping center. Then, Masonry becomes the one alternative method in maintaining the competitive market with less labor intensive building systems (Beall, 2000).

2.2 Masonry productivity

A study by (Sanders & Thomas, 1992, 1993) found the project-related factors such as work type, building element, construction method and design requirement influence the productivity by using the masonry system. Understanding the factors would help the designers to design masonry structure that would construct more efficiently and manageable of the masonry projects.

2.3 Sustainability of Masonry

(B. Edwards & Turrent, 2002) defined sustainable housing as affordable housing that incorporates environmentally friendly, use natural of resources, better quality of life and economic growth. Sustainable housing provision requires proper definition of housing needs and the use of sustainable building material is one of the environmental responsible (Michael D. Adedeji, 2012) because it offers low maintenance, energy conservation, improve productivity, greater flexibility, improve occupant's health and use of natural resources (GBI, 2009)

Masonry performs simultaneous functions of carrying load and enclosing space, while possessing strong properties for fire resistance, thermal and sound insulation and protection against environmental exposure (J. Edwards, Gayed, Pyra, & Rodriguez, 2010; Sharath, Vikas, & Kumar, 2013). As a result, masonry is a cost-effective and low-energy alternative when designed appropriately (El- Adaway, Breakah, & Khedr, 2011; Michael D. Adedeji, 2012; Ramamurthy & Nambiar, 2004).

2.4 Masonry for housing construction

The use of masonry, namely interlocking bricks is growing in popularity around the world. Through the research and development, this system was acceptable for housing demands (Adedeji, 2011; Nasly & Yassin, 2009; Thanoon et al., 2004). This method more adopted in the housing construction due to its simplicity in block laying, less mortar and independent of workmanship variations (Anand & Ramamurthy, 2005).

2.5 Advantages of Masonry

The use of the masonry system because of its advantages such as in design, construction and cost (Ramli, Abdullah, & Nawi, 2013; Sinha, 2002). A LBM system could provide 10 to 20 percent saving from the total building cost compared to a conventional RC building.

The system does not require any expensive tools, machine and plan, only skilled workers were needed in laying the number of bricks or blocks (Allen and Thallon, 2006; Hendry, 2001).

2.6 The adoption of masonry

The adoption of a masonry system in construction was widely implemented especially in developing countries. Studied by (Michael D. Adedeji, 2012) found the adoption of the masonry system influence by shorter time and reduce cost for the construction. Meanwhile, (Abdullah, Zulhumadi, & Othman, 2009) in their study concluded that the adoption of the system among the industry player are in low level but the awareness of the technology is high.

Due to innovation through the design, this system more implemented in Malaysia, for example, the Bungalow in FELDA LAKA, Kedah (Nasly & Yassin, 2009) and then the builders interested to practice this system for the housing construction activities. It noticed that, the masonry structure is recognized in Malaysia's housing industry.

Table 1: Previous Study of Masonry System

No	Studies	Authors
1.	Historical and development of masonry	(Beall, 2000; Sinha, 2002)
2.	Masonry Productivity	(Sanders & Thomas, 1992, 1993)
3.	Sustainable masonry	(El- Adaway et al., 2011; Michael D. Adedeji, 2012; Nasly & Yassin, 2009; Sharath et al., 2013)
4.	The use of interlocking masonry for housing construction	(Adedeji, 2008, 2011; Thanoon et al., 2004)
5.	The advantages of masonry system	(Ramli et al., 2013; Sinha, 2002)
6.	The adoption of masonry system in construction	(Abdullah et al., 2009)

Discussion

From the review of literature, the studies of masonry structure particularly about the development of the system, masonry productivity, sustainability and advantages of the masonry system. Despite of this, the masonry becomes one of the alternative methods for the construction, but, factors influence the adoption of this system among the industry players are not deeply investigated. An understanding the factors influencing the adoption in the construction organization would help the practitioners and government in enhance the usage of the system in construction activities.

Conclusion

Masonry system has been developed and worldwide interests in the construction sector through it advantages of this system. The masonry products discussed an addressed variety of needs and it aimed at improved performance and increased construction economy. Additionally, this system could solve the problems related to construction such as shortage in materials, workers and materials wastage. For the future study, it is interest to investigate

the factor influence the adoption of this system in understanding the situation of the industry players in acceptance of this system as an alternative method for construction.

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